CLAIMS

What is claimed is:

1. A system for superheterodyne detection comprising:

a first conversion unit for performing a first heterodyne operation on an optical input signal to generate an electrical IF signal; and

a second conversion unit electrically coupled to said first conversion unit for performing a second heterodyne operation to generate an electrical output signal suitable for signal processing.

2. The system of Claim 1, wherein said first conversion unit comprises:

a local oscillator for generating a swept optical local oscillator signal;

a coupler for coupling said optical input signal and said swept local oscillator signal; and

a photodetector.

3. The system of Claim 1, wherein said first conversion unit comprises:

an IF amplifier; and

an IF filter.

4. The system of Claim 1, wherein said second conversion unit comprises:

an electrical local oscillator for generating a fixed electrical local oscillator signal; and

a mixer coupled to said electrical local oscillator for performing a second heterodyne operation when mixing said electrical IF signal and said fixed electrical local oscillator signal to generate an electrical output signal suitable for signal processing.

5. The system of Claim 1, where said signal processing comprises a reconstruction of an optical spectrum of said optical input signal.

6. The system of Claim 1, further comprising:

a processor for processing said electrical output signal to measure optical parameters of said optical input signal.

7. The system of Claim 1, wherein said first conversion unit reduces the effect of intensity noise.

8. The system of Claim 1, wherein said first conversion unit separates an image in said electrical IF signal to improve amplitude accuracy of said optical input signal.

9. The system of Claim 1, wherein said first conversion unit produces a non-zero electrical IF signal.

10. The system of Claim 1, wherein said second conversion unit comprises a microwave image rejection mixer.

11. The system of Claim 1, wherein said second conversion unit comprises a band pass filter coupled to said first conversion unit, wherein said band pass filter is offset from an electrical local oscillator in said second conversion unit to further reduce an image.

12. The system of Claim 1, wherein said second conversion unit downconverts said electrical IF signal to said electrical output signal.

13. A system for superheterodyne detection comprising:

a first conversion unit for performing a first heterodyne operation on an optical input signal to generate an optical IF signal; and

a second conversion unit optically coupled to said first conversion unit for performing a second heterodyne operation to convert said optical IF signal to an electrical output signal suitable for signal processing.

14. The system of Claim 13, wherein said first conversion unit comprises:

a local oscillator for generating a swept optical local oscillator signal;

a coupler for coupling said optical input signal and said swept optical local oscillator signal; and

a photodetector.

15. The system of Claim 13, wherein said first conversion unit comprises:

an optical IF amplifier; and

an optical IF filter.

16. The system of Claim 13, wherein said second conversion unit comprises:

a square law photodetector for performing said second heterodyne operation to generate said electrical output signal.

17. The system of Claim 13, where said signal processing comprises a reconstruction of an optical spectrum of said optical input signal.

18. The system of Claim 13, further comprising:

a processor for processing said electrical output signal to measure optical parameters of said optical input signal.

19. The system of Claim 13, wherein said first conversion unit reduces the effect of intensity noise.

20. The system of Claim 13, further comprising:

an optical filter optically coupled to said first conversion unit for rejecting a first image in said optical IF signal to generate a filtered optical IF signal.

21. A method for superheterodyne detection comprising:

performing a first conversion on an optical input signal to generate an IF signal by implementing a non-zero IF; and

performing a second conversion on said IF signal to generate an electrical output signal suitable for being processed.

22. The method of Claim 21, wherein said performing said first conversion comprises:

performing a first heterodyne operation to combine said optical input signal and an optical swept local oscillator signal to generate said IF signal in an electrical domain; and wherein said performing said second conversion comprises:

performing a second heterodyne operation to combine said IF signal in said electrical domain and a fixed electrical local oscillator signal to generate said electrical output signal.

23. The method of Claim 22, wherein said performing said second heterodyne operation comprises:

downconverting said IF signal in said electrical domain to said electrical output signal.

24. The method of Claim 21, further comprising:

filtering said IF signal to reject a first image from a pair of images in said IF signal.

25. The method of Claim 21, further comprising:

filtering intensity noise and a first image from a pair of images in said IF signal with an optical filter placed in front of said fist conversion unit that is offset from an optical local oscillator in said first conversion unit.

26. The method of Claim 21, further comprising:

processing said output electrical signal to measure an optical field spectrum of said optical input signal.

27. The method of Claim 21, further comprising:

processing said electrical output signal to measure parameters of said optical input signal.

28. The method of Claim 21, wherein said IF signal comprises a non-zero electrical IF signal.

29. The method of Claim 21, further comprising:

performing said second conversion with a microwave image rejection mixer.

30. The method of Claim 21, further comprising:

filtering said IF signal to reducing an image.

31. A system for superheterodyne detection comprising:

a first conversion unit for performing a first heterodyne operation to combine an optical input signal and a swept optical local oscillator signal, said first conversion unit generating an electrical IF signal;

a second conversion unit electrically coupled to said first conversion unit for performing a second heterodyne operation when combining said electrical IF signal and a fixed electrical local oscillator signal to generate an electrical output signal; and

balanced detection unit for canceling intensity noise.